3 DEPOSIT 2 REMEDIATION

3.1 Basis of Design

The sediment cleanup remedy for Deposit 2 includes removal of sediments containing PCB concentrations above 62 μg/Kg (representing approximately 95 percent of the total PCB mass present in sediments within the Donkey Island area), and backfilling the excavated areas and associated excavation residuals with clean sand. Design considerations relevant to Deposit 2 are provided in the FS (Anchor 2005b), RDWP (Anchor 2005c), and *30 Percent Design Technical Memorandum* (Anchor 2006a). The basis of design for Deposit 2 was primarily informed by three field efforts:

- Fall 2005 sediment sampling and chemical analysis
- March 2006 bathymetric survey
- April 2006 sediment probing

Incorporation of the 2005 and 2006 data did not substantively change the remedial design for Deposit 2 as originally described in the FS and FCAP. However, the recent data were used to refine design drawings and update excavation and backfill volumes. The new data supported development of more precise excavation designs (including overdepth allowances) for removal of contaminated sediments from Deposit 2, obviating the need for initial contractor surveys and post-excavation sediment verification sampling to determine the extent of required removal. The updated design thus improves certainty that the excavation action will achieve cleanup requirements within Deposit 2, while allowing excavation and backfill operations to proceed in a more timely and efficient manner.

3.1.1 Fall 2005 Sampling and Analysis

Sampling was conducted at Donkey Island in November 2005 to inform an appropriate remedial action in the Donkey Island area. Prior to this event, determination of the need for and scope of remedial actions in this area were based upon only a single data point (Station 40) exceeding the 62 μg/Kg dw cleanup level (sediments in nearby off-stream channels were also previously sampled and contained lower PCB concentrations).

Ten locations were sampled during the November 2005 sampling event. Sampling locations were selected in the field based upon the presence of fine-grained sediments. Although localized deposits of recently deposited soft sediments were delineated during

this sampling event, the Deposit 2 area was primarily comprised of relatively coarse riverine materials (i.e., ½-inch or larger rock and gravel). Soft sediments were only observed in relatively low energy areas, and were generally located adjacent to the shoreline. The sole exception to this general shoreline distribution of soft sediment occurred within the Station 104 backwater channel, where soft sediments were found to extend roughly to the middle of the channel. Whenever the soft sediment thickness exceeded 1 foot, deeper sediments were also sampled using a hand auger. A summary of the fall 2005 sampling data is provided in Table 1 and Figure 5.

Table 1
Deposit 2 Sampling and Analysis Results

Station	Depth Interval (cm)	Total PCBs (µg/Kg dw)	Location	Field Grain Size Characteristics
100	0-7.5	**76**	Deposit 2A	43% fines; medium-fine sand and silt overlying gravel & cobble
101	0-10	**530**	Deposit 2A	1% fines; silty sand in upper 3cm, grades to gray sand
101	10-16	**160**		medium to fine sand with organic matter
101	16-56.64	31		gray to rusty sandy gravel
102	0-10	20	Deposit 2A	3% fines; medium sand with organic matter
102	10-26	**63**		medium sand with organic matter
102	26-61.56	19		medium sand with one clay layer
103	0-10	10	Deposit 2A	12% fines; organic matter with leaves
103	10-29	12		coarse to medium sand with organic matter, some cobble (2" rocks)
103	29-54.4	ND		coarse to medium sand with gravel
104	0-10	**155**	Deposit 2A	10% fines; silty organic matter
104	10-20	**221**		sandy silt and clay with organic matter
104	20-45.4	**596**		layer of clay with sandy silt
105	0-11	**96**	channel	15% fines; medium sand and silt with organic matter
105	11-29	12		medium sand, silt and some clay with organic matter
106	0-10	34	channel	11% fines; medium sand and organic matter
106	10-25	ND		fine sand and silt with organic matter
107	0-12	**275**	Deposit 2B	4% fines; medium sand with organic matter
107	12-29	**237**		fine sand and silt with organic matter and woody debris
108	0-10	13	channel	11% fines; medium to fine sand with organic matter
108	10-18	ND		coarse to medium sand and organic matter
109	0-10	ND	channel	6% fines; medium sand and silt with organic matter
109	10-19	15		coarse sand and gravel with organic matter

Bold = exceeds 62 µg/Kg dw criteria

3.1.2 March 2006 Bathymetric Survey

Scott Valentine Surveying was contracted in March 2006 to conduct a bathymetric survey of the Deposit 2 area. Their work included the following:

- Detailed bathymetric survey of the prospective Deposit 2 remedial action area, extending at least 20 feet past the edge of the water into the adjacent uplands.
- Placement of a survey control monument for use by the remedial action contractor during upcoming construction phases.
- Delineation of the edge of the wetted channel.
- Delineation of footpaths and improved trails in the area (i.e., Centennial Trail), along with fence lines, power lines, and utility poles.
- Confirmation that fence lines correspond to property lines within the survey area.

All survey data were recorded using State Plane North American Datum 1983 (NAD83), Washington North for horizontal positioning and North American Vertical Datum of 1988 (NAVD88) for vertical positioning.

Ice covering the side channels around Donkey Island prevented in-water surveying until March 2006. Once the ice thawed, the survey was completed and the data points and corresponding bathymetric/topographic map were provided to Anchor Environmental, L.L.C. (Anchor) in mid-on April 15, 2006. The data were incorporated into the design drawings provided in Appendix A.

3.1.3 April 2006 Sediment Probing Survey

Sediment probing was conducted within the two prospective Donkey Island excavation areas (Deposits 2A and 2B) on April 5, 2006. At Deposit 2A, the purpose of the probing was to more precisely delineate the vertical and horizontal extent of soft sediments within the excavation area. For Deposit 2B, the purpose of the survey was to define the horizontal extent of soft sediments and then to delineate the vertical extent of soft sediments within that area.

Sediment probing transects in Deposits 2A and 2B were delineated by laying a tape measure perpendicular to the shore and probing along the length of the tape. Observations were recorded every foot or whenever there was a change in substrate material. The soft sediment depth below the sediment:water interface was measured at each probing location by pushing a 0.5-inch diameter steel T-probe into the sediment

until the soft sediment layer had been penetrated and encountered underlying compacted materials. Water depths, mudline elevations, and station positioning were determined at each location using a differential geographic positioning system (DGPS), and the data recorded in the field. The April 2006 survey results were consistent with depths of soft sediments observed during the earlier (November 2005) sediment characterization, and provided additional data to more precisely delineate the Deposit 2 excavation prisms, as discussed below. The data are summarized in a technical Memorandum presented to Ecology in May 2006 (Anchor 2006b).

3.2 Deposit 2 Excavation Prisms

3.2.1 Deposit 2A (Stations 100 to 104) Sediment PCB Concentrations

During the November 2005 field investigation, Stations 100, 101, 102, and 104 contained surficial concentrations of total PCBs above the 62 μg/Kg dw sediment cleanup level. At Station 100, the underlying clean cobble/gravel layer was observed at a depth of 3 inches below mudline. Station 101 contained low levels of PCBs (31 μg/Kg dw) in underlying sandy gravel beginning approximately 6 inches below mudline. Similarly, at Station 102, low concentrations of PCBs (less than 20 μg/Kg dw) were observed in underlying coarse sand beginning approximately 10 inches below mudline. Station 103 contained low levels of PCB (less than 20 μg/Kg dw) throughout the core, including at the sediment surface. Sediment PCB concentrations at Station 104 exceeded the 62 μg/Kg dw cleanup level throughout the depth of the core, to the maximum 18-inch depth of recovery above coarse underlying materials.

3.2.2 Basis of Deposit 2A Excavation Plan Design

The horizontal extent of Deposit 2A is bounded by the stations where previous analytical results showed non-detected or low (less than 62 μg/Kg dw) concentrations of PCBs observed to the southwest (Station 57) and to the southeast (Station 42) of Deposit 2A, and is bounded by adjacent uplands in other areas of the deposit (Figure 3). The soft sediment survey conducted in early April 2006 further refined the horizontal extent of contaminated sediments in Deposit 2A. Specifically, along the northwest bank of Deposit 2A adjacent to Stations 101, 102, and 103, an exposed nearshore cobble/gravel bed approximately 115 feet long was delineated within approximately 20 feet of the shoreline, with no overlying soft sediment. In contrast, at the southwest end of Deposit

2A (Station 100), the soft sediment surface layer was only present in nearshore areas within a 20 foot distance from the bank. On the northwest end of Deposit 2A (Station 104), 12-inch-minus rock with minimal interbedded silt and organics was present within 10 feet of the shoreline, transitioning into finer deposits further offshore. Within the vicinity of Station 104, which is located at the end of a depositional side channel, the boundary of the Deposit 2A excavation area was defined as the interface between the water surface and adjoining emergent vegetation. Restricting the excavation to this area will minimize construction-related impacts to habitat and native plants in this area.

The vertical limits of excavation within Deposit 2A were based the combined results of the fall 2005 core sampling and the spring 2006 bathymetric and poling surveys. In all cores and poling locations, the contact between the bottom of the surficial soft sediment deposit and the underlying coarse sand/gravel/cobble layer was observed between elevation 1,910.5 and 1,911.0 feet above mean sea level (MSL; i.e., within a relatively consistent elevation range of 0.5 feet). The thickness of soft sediments in this area ranged from roughly 0.25 to 1.5 feet (3 to 18 inches). Given the consistency in the elevation of the contact between the bottom of the surficial soft sediment deposit and the underlying coarse sand/gravel/cobble layer, the excavation plan specifies a required excavation elevation throughout Deposit 2A of 1,910.5 feet MSL. Due to the equipment tolerances discussed above, an additional 0.5 feet (6 inches) of over-excavation (i.e., to elevation 1,910.0 feet) will given to the contractor to ensure that they meet the required elevation (Figure 6).

3.2.3 Deposit 2B (Stations 105 to 109) Sediment PCB Concentrations

During the November 2005 field investigation, only two of the five sampling locations in Deposit 2B (Stations 105 and 107) contained surficial sediment concentrations of total PCBs above the 62 µg/Kg dw sediment cleanup level. At Station 105, the underlying clean sand layer was observed at a depth of 4 inches below mudline. Station 106 contained low levels of PCB (less than or equal to 34 µg/Kg dw) throughout the core, including at the sediment surface. Sediment PCB concentrations at Station 107 exceeded the 62 µg/Kg dw cleanup level throughout the depth of the core, to the maximum 11-inch depth of recovery above underlying gravel materials. Stations 108 and 109

contained low levels of total PCBs (less than or equal to 15 μg/Kg dw) in all sediment intervals sampled.

Because of difficult access, limited vertical and horizontal extent, and sediment concentrations that only marginally exceed the 62 μg/Kg dw sediment cleanup level, surficial sediments at Station 105 will not be removed. Surficial sediment deposits in the vicinity of Station 105 constitute less than approximately 4 percent of the total mass of PCBs delineated in the Donkey Island area. Without removal of sediments in the vicinity of Station 105, the remedial action will still achieve at least 95 percent removal of the PCB mass in Deposit 2, consistent with the Final CAP (Ecology 2005).

3.2.4 Basis of Deposit 2B Excavation Plan Design

The horizontal extent of removal near Station 107 is bounded by relatively low sediment PCB concentrations (less than or equal to 34 μg/Kg dw) observed west and east of Deposit 2B at Stations 106 and 108, respectively. The upland shoreline and the presence of relatively coarse-grained materials offshore of Station delineate the northern and southern boundaries of Deposit 2B, respectively. Soft sediments in Deposit 2B are confined to the lower energy depositional area found along the north bank. At Station 107, probing surveys performed perpendicular to the bank indicated that soft sediments extend approximately 15 to -20 feet offshore of the shoreline. Soft sediments are not evident at the eastern and western boundaries of Deposit 2B.

The vertical limits of excavation within Deposit 2B were based the combined results of the fall 2005 core sampling and the spring 2006 bathymetric and poling surveys. In all cores and poling locations, the contact between the bottom of the surficial soft sediment deposit and the underlying coarse sand/gravel/cobble layer was observed between elevation 1,913.0 and 1,913.5 feet MSL. Similar to Deposit 2A, the bottom of soft sediment deposits in this area occurred within a relatively consistent elevation range. Given the consistency in the elevation of the contact between the bottom of the surficial soft sediment deposit and the underlying coarse sand/gravel/cobble layer, the excavation plan specifies a required excavation elevation throughout Deposit 2B of 1,913.0 feet MSL. Due to the equipment tolerances discussed above, an additional 0.5

feet (6 inches) of over-excavation (i.e., to elevation 1,912.5 feet) will be given to the contractor to ensure that they meet the required elevation (Figure 6).

3.2.5 Excavation and Backfill Design

Sediments within the horizontal and vertical boundaries of the Deposits 2A and 2B excavation limits, as defined in Appendix A (Sheets C2 to C4), will be removed and the excavated area will be backfilled with clean sand such that it is returned to its near pre-excavation elevations. The excavation prism is horizontally delineated by control points that reference DGPS coordinates. These control points will be used by the contractor for the execution of the work. The vertical extent of excavation within Deposits 2A and 2B will be confirmed through post-excavation bathymetric surveys. The contractor will excavate to the required elevation as depicted on the Appendix A plans. Defining the excavation limits by control points and elevations is standard in the environmental dredging industry and the most efficient means to execute and pay for the work. The surface areas of the Deposits 2A and 2B excavation areas are 7,360 square feet (sf) and 1,340 sf, respectively. The estimated excavation volume including over excavation allowance in Deposits 2A and 2B are 550 (cy) and 50 cy, respectively.

3.2.6 Access Routes and Staging/Stockpiling Areas

During the November 2005 sampling event at Deposit 2 (described in the RDWP), prospective haul routes, access routes, and staging areas were identified (Figure 6 and Appendix A Sheets C1 and C6). In general, trucks will move along the truck haul route to and from the stockpiling/staging area. Because terrain is restrictive at Deposit 2, a front-end loader or similar equipment will be used to transport material from the excavation site to the staging/stockpiling area. This method provides the safest and most efficient means for construction at Deposit 2. Additionally, use of this method will help minimize damage to site wildlife habitat, and will limit equipment and truck traffic on the Centennial Trail.

Figure 6 depicts the truck access route that travels south from N. Raymond Road across a field owned by Centennial Properties, Inc. Use of this route would minimize impact to local neighborhoods, provide the most direct route to a major road, minimize impacts to existing habitat, reduce the construction necessary for site access, and reduce the impact

and damage to the existing Centennial Trail. In addition to the backwater channel, there are also a considerable number of trees and a significant slope in the general vicinity of Deposit 2, which possibly makes driving trucks and heavy equipment closer to the site than the depicted access route dangerous and cumbersome.

Construction equipment including delivery trucks will proceed from N. Raymond Road along the access route to the traffic control point. Coordination by the contractor at the traffic control point will ensure that trucks and equipment move along the delineated road in a one-way fashion. This will minimize congestion and the need to buck up any of the larger pieces of equipment (i.e., delivery and disposal trucking).

A Deposit 2 staging/stockpiling area will be delineated in the vicinity of the truck access loop as shown in Figure 6 and will be located on the Washington State Department of Parks and Recreation property. The Deposit 2 staging/stockpiling area will be made suitable for use by the contractor by clearing any vegetation and debris. Trees that are 10 feet and higher will be left in place. Any tree that is between 2 and 10 feet and removed as part of construction will be replanted following construction activities (see Section 3.2.7 below).

The staging/stockpiling area will be sectioned to accommodate two functions. One section will be used as a staging area for delivery of the clean backfill material. This area will be sufficiently protected by the contractor from environmental conditions such as wind and rain. Ecology blocks, jersey barriers, and/or rain tarps are examples of measures that could be taken for environmental protection of the site.

The second section of the Deposit 2 staging/stockpiling area will be designated for the stockpiling of the contaminated sediments. This area will be enclosed by a suitable barrier (Jersey barrier, "ecology" blocks, or a similar method) and lined along the inside of the enclosure with an impermeable liner of polypropylene or similar material to minimize the discharge of water or sediment from the stockpile area (Appendix A, Sheet C1). The excavated material from Deposits 2A and 2B will be placed within this enclosure and allowed to passively dewater prior to shipment to the disposal facility. Because of the considerable sand content of the target sediments, passive dewatering is

likely to proceed relatively quickly (within 2 days), and gravity should be sufficient to dewater the sediments. If additional dewatering is needed prior to transport, lime or Portland cement additives may be needed. Further details on sediment dewatering can be found in section 3.2.10.

A security fence will likely be installed in the staging/stockpiling area for safety precautions as well as security measures. The Centennial Trail will also be regulated by the contractor to allow safe public use during construction.

Upon completion of the work at Deposit 2, the contractor will remove all remaining backfill material, barriers (sandbags), liners, and other materials and clean up the site to the pre-project condition.

3.2.7 Habitat Protection

The area surrounding Deposit 2 is a unique ecological environment featuring various native vegetation communities of plants, bushes, and grasses. Several strands of mature trees also exist in the area, which provide cover and large woody debris habitat functions to the Spokane River. In order to practicably minimize disturbances to existing habitat in the vicinity of Deposit 2, the contractor will adhere to the requirements of a Habitat Protection Plan (HPP) to be prepared for the remedial action. The haul and access routes, staging and stockpiling areas and excavation boundaries of the HPP will be established in the final (100 Percent) design plans and specifications. A vegetative survey is ongoing and will be incorporated into the HPP provided as part of the final design submittal. The results of the survey will also serve as the baseline pre-construction condition at Deposit 2, and will identify native vegetative communities in the project area that could be impacted during construction. The HPP will detail the contractor's restoration requirements following completion of construction and provide guidance on bush removal, live storage, replanting, and tree protection.

Though care will be taken as practicable to preserve existing habitat in the Deposit 2 area, some construction related impacts are unavoidable and will be mitigated by reasonable restrictions, construction management practices, and restoration requirements to be detailed in the HPP. Table 2 lists some potential habitat impacts and

the contractor actions that will limit disturbance and help ensure that Deposit 2 rapidly returns to its near pre-construction condition upon completion of the work.

Table 2
Mitigation Measures for Deposit 2 Areas Impacted by Construction

Impacted Area	Mitigation Measure
Delivery Truck Haul Route	Haul routes are restricted to existing trails. Base course or fabric may be used by the contractor to prevent major disturbance of the trail. Haul routes will be returned to near-existing grade and condition.
Access Routes to Deposits	Access routes will be limited to areas delineated on the drawings. Access routes will be along existing footpaths or in-water routes. Paths will be regraded and restored as practicable upon completion.
Staging/Stockpiling Area	The Engineer will mark designated areas prior to construction, which Impacted area is a grassy field that can be reseeded. Mature trees over 10 feet tall will be protected.
Excavation Areas	Contractor will submit work plan for approval prior to construction. Wheeled or low ground pressure vehicle may be used by the contractor. Contractor can excavate from the water.

3.2.8 Water Quality Controls in Backwater Channel

A turbidity containment system will be placed in the channel around the remediation areas of Deposit 2 (Appendix A, Sheet C1). Sand bags or a similar product will be placed in the channel to prevent turbidity releases outside of the work area. Except during extreme high flows and flood events, minimal flow exists in the backchannel surrounding Deposit 2 and the water depth ranges from 1 to 4 feet. No other water quality controls are anticipated.

3.2.9 Sediment Removal

The construction sequence for the removal of contaminated sediments at both Deposits 2A and 2B is generally described below:

- Once the turbidity containment system is in place, an excavator or similar equipment will remove the specified amounts of material from Deposit 2.
- Access between the staging/stockpiling areas and the deposits will be confined to in-water routes or upland routes delineated in Sheet C6 of Appendix A.

- Excavation will be conducted in the water or from the designated boundaries as depicted in Sheet C6 of Appendix A. These boundaries are designed to minimize impacts and disturbances, as practicable, to the valuable ecological habitat that exists in the vicinity of Deposit 2. Even while operating in these boundaries, the contractor will be encouraged to exercise great care to minimize construction impacts.
- The excavated material will be placed in an earthmover (such as a small front end loader) and moved to the Deposit 2 staging/stockpiling area via the access route depicted in Figure 6.
- Upon completion of the work at Deposit 2, the access routes and staging/stockpiling areas will be returned to the near pre-construction conditions, as described in section 3.2.7, the habitat protection section above.

Earthmoving equipment used by the contractor will conform to specifications concerning spillage and containment of the sediment as it is transferred to the staging/stockpiling area.

3.2.10 Sediment Dewatering

The excavated sediment will be stockpiled in the contaminated sediment containment area (Appendix A, Sheet C1) and allowed to passively dewater before transfer to disposal trucking. The free water and interstitial water in these sediments that drains off during this process will be collected in the containment facility. All of the entrained water will be discharged back to the excavation area.

In order to pass the Paint Filter Liquids Test that may be required at some disposal facilities, the contractor may elect to mix approved additives with the sediments to bind available water. However, several regional landfills currently do not require conformance with the Paint Filter Liquids Test, as free water is beneficial to landfill degradation processes at these locations. Upon completion of the work, the contractor will remove residual excavated sediments, barrier materials, liners, and other materials and clean up the site to the pre-project condition in accordance with the requirements outlined in the section 3.2.7 habitat plan described above.

3.2.11 Sediment Transport and Disposal

Depending on the facility utilized for disposal, the excavated material may be taken in trucks to the landfill operator's rail transfer station where it will be loaded on rail cars for shipment, or it may be transported by truck directly to the landfill site. The contractor will utilize appropriate controls, such as lining truck beds or rail containers, and/or covering loads, to prevent any loss of excavated material during transport. Special care will be taken to prevent spillage onto public roadways or adjacent property and any such spillage will be promptly cleaned up. Some regional disposal facility locations for the excavated sediment are listed below. This is not a complete list of locations and the contractor may elect to propose another location for approval:

1. Regional Disposal Company
   Roosevelt Regional Landfill
   Klickitat County, Goldendale, Washington
2. Oregon Waste Systems (Subdivision of Waste Management, Inc.)
   Columbia Ridge Landfill and Recycling Center
   Arlington, Oregon

The contractor will make arrangements for transportation and disposal or treatment of the excavated material with the upland disposal facility operator. However, the responsibility for satisfactory disposal or treatment will remain with the contractor.

3.2.12 Backfill of Removal Areas

Clean sand material meeting specifications will be purchased from a regional supplier and delivered to the Deposit 2 staging/stockpiling area. The backfill material will meet Ecology (2003) freshwater LAET chemical guidelines and conform to the following gradation specifications:

Sieve Size	Percent Passing (by weight)
U.S. No. 4	100
U.S. No. 10	25 to 100
U.S. No. 40	20 to 60
U.S. No. 200	10 max

Once the excavation of the contaminated material is complete, an earthmover will transport the clean sand to the Deposit 2 site where it will be placed by the excavator. The description of the construction sequence for Deposits 2A and 2B is generally described below:

- A clean bucket of backfill material will be placed just above the surface of the water.
- After the appropriate amount of backfill material has been placed, the sand surface will be verified to ensure the specified thickness is achieved.
- Because the site is small and the water is relatively shallow, the contractor will develop approved on-site backfill quality control measures. Staking a gauge on the edge of the deposit prior to the backfill material being placed and measuring the thickness once placed is one method that could be used.

Upon completion of the backfill, the deposit and excavation area will be restored by the contractor to its approximate pre-excavation condition as detailed in section 3.2.7 the habitat protection plan described above in order to preserve the shoreline and river riparian/backwater habitat surrounding Deposit 2.